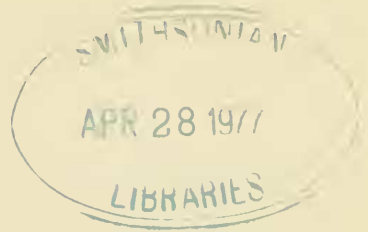


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THREE NEW SPECIES OF INDO-PACIFIC MORAY EELS
(PISCES: MURAENIDAE)

by

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ABSTRACT: Three new species of Indo-Pacific muraenid eels are described and illustrated: *Gymnothorax breedeni* n.sp. an eel from moderate depth reefs, from the Comoro, Amirante, Maldive, Marquesas, and Line islands; *Uropterygius kamar* n.sp. a deep-reef, burrowing eel from the Comoro, Amirante, Society, Solomon, Caroline, and Pitcairn islands; and *U. goslinei* n.sp. a shallow-reef eel from New Guinea, and the Caroline and Solomon islands.

INTRODUCTION

Recent deep water collections using rotenone ichthyocides in the tropical Indian and Pacific oceans have resulted in the discovery of two new moray eels. With a grant from the Charline Breeden Foundation, the senior author was able to make the first extensive series of reef fish collections from the remote Archipel des Comores (Comoro Islands). Those specimens complement the extensive collections made by the junior

author throughout Oceania, and extend the range of many Pacific species to include the western Indian Ocean. In the process of describing these morays, a third and distinctive new species was discovered among the collections of reef fishes made by the George Vanderbilt Foundation, now housed at the California Academy of Sciences.

Measurements are straight-line, made either with a 300-mm ruler with 0.5-mm gradations (for total length, trunk length, and tail length) and recorded to the nearest 0.5 mm, or with dial cali-

pers (all other measurements) and recorded to the nearest 0.1 mm. Body length comprises head and trunk lengths. Head length is measured from the snout tip to the posterodorsal margin of the gill opening; trunk length is taken from the end of the head to mid-anus; maximum body depth does not include the median fins. Vertebral counts (which include the hypural) were taken from radiographs. Materials used in this study are housed at the following institutions: Australian Museum, Sydney (AMS); Academy of Natural Sciences of Philadelphia (ANSP); Bernice P. Bishop Museum (BPBM); California Academy of Sciences (CAS), including George Vanderbilt Foundation Collections, GVF); U.S. National Museum of Natural History (USNM); J.L.B. Smith Institute of Ichthyology, Rhodes University (RUSI); and the Scripps Institution of Oceanography (SIO). Paratypes of *Uropterygius kamar* will be deposited at the Muséum National d'Histoire Naturelle Paris (MNHN), and the British Museum (Natural History).

ACKNOWLEDGMENTS

We wish to thank the following individuals: Maurice C. Giles for photographic assistance; William C. Ruark and James E. Gordon for the preparation of radiographs; Virginia M. Gregory (Figs 3 a-c), Katherine P. Smith (Fig. 5), and Mary H. Fuges (Figs. 1-2) for their artwork; Lillian J. Dempster and William N. Eschmeyer for their

critical reading of this manuscript; and the curators of fish collections for allowing us to examine specimens. James E. Böhlke kindly made available his specimens of the new species and the illustrations prepared by Mary Fuges. Randall's collections were made possible in part by grants from the National Geographic Society and the American Philosophical Society. A portion of McCosker's work was supported by funds from the Charline Breeden Foundation. We are especially grateful to the people of the Archipel des Comores, and in particular, to Chief Mohammed Ali Chabane and Prince Nacr-Ed-Dine, for allowing us to collect specimens.

TAXONOMY

Gymnothorax breedeni McCosker & Randall, new species

(Figures 1-3, Table 1.)

Gymnothorax sp.: Randall & Helfman, 1972: Figs. 5-6 (photographs of Marquesas specimens mentioned in text).

Gymnothorax sp.: McCosker & McCosker, 1976: 26 (Comoran specimens mentioned in text).

MATERIAL EXAMINED. *Holotype*: CAS 35250, 530 mm. Archipel des Comores, Isle Grande Comore, Itsandra, 0.5 km north of Hotel Itsandra. Captured in 20 m among coral and rock within a large cave, 50 m offshore, on 19 February 1975 by J. E. McCosker, S. McCosker, M. D. Lagios, L. Gunther, and D. C. Powell, using Pronoxfish ichthyocide. *Paratypes*: USNM 215283 (formerly BPBM 7763), 645 mm, Line Is., Washington Id., 15 m, J. E. Randall. BPBM 11903, 524 mm, Marquesas Is., Tahuata, 10 m, J. E. Randall. ANSP 134222, 496 mm, Amirantes Is., D'Arros Id., 4 m, J. E. Böhlke.

TABLE 1. Counts, and proportions in thousandths, of the holotypes and paratypes of *Gymnothorax breedeni* (3 paratypes), *Uropterygius goslinei* (7 paratypes), and *U. kamar* (9 paratypes). TL = total length, HL = head length.

	<i>G. breedeni</i>			<i>U. goslinei</i>			<i>U. kamar</i>		
	Holotype	Mean	Range	Holotype	Mean	Range	Holotype	Mean	Range
Total length	530 mm	549	496-645	483 mm	271	149-527	249 mm	232	164-345
Vertebrae	128	128.5	128-129	127	127.9	124-130	137	136.3	134-138
Head/TL	132	130	122-136	116	116	105-121	102	103	95-108
Trunk/TL	340	336	302-356	300	309	300-333	305	306	299-307
Tail/TL	528	533	512-562	584	574	547-587	592	592	571-606
Snout/HL	181	179	171-186	161	170	161-197	161	158	132-183
Jaw/HL	379	374	353-398	368	386	328-458	369	360	279-423
Eye/HL	79	87	76-112	73	65	55-76	75	69	63-77
Interorbital/HL	119	140	119-170	115	119	105-133	110	97	79-119
Depth/HL	543	622	475-765	482	405	348-482	373	353	316-402
Width/HL	314	364	312-470	339	264	205-339	267	224	195-267

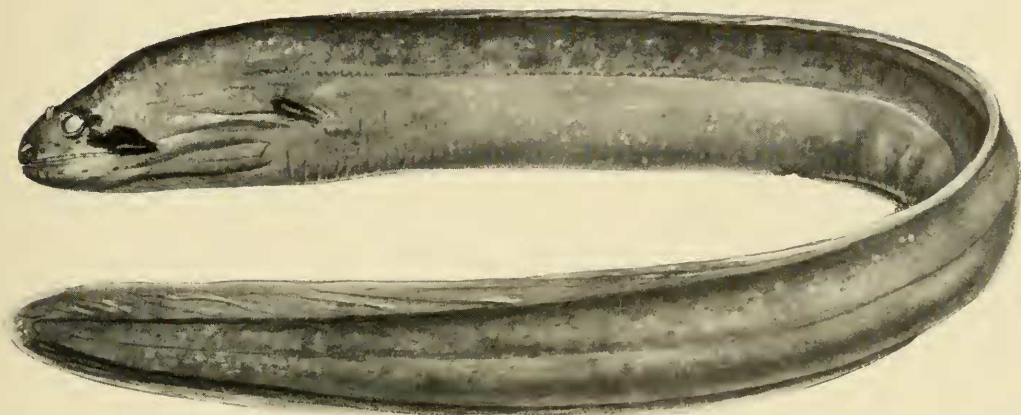


Figure 1. *Gymnothorax breedeni*, paratype, ANSP 134222, 496 mm.

DIAGNOSIS. A moderate length species of *Gymnothorax* with anus before mid-body, tubular anterior nostrils and slightly raised posterior nostrils, uniserial jaw teeth, vomerine teeth either absent or few, and a brown coloration with distinctive black areas behind the eye, at the rictus, and over the gill opening.

DESCRIPTION OF HOLOTYPE. (Counts and proportions of the holotype and the three paratypes are given in Table 1.) Greatest depth of body 14 times in total length (TL). Body width 1.7 times in depth. Tail longer than body, distance from snout to anus 2.12 times in TL. Head 7.6 times and trunk 2.9 times in TL. Dorsal fin origin ahead of gill opening, the predorsal distance ca. 8.8 times in TL. Dorsal fin height at gill opening ca. 3.5 times in body depth. Snout 5.5 times and upper jaw 2.6 times in head length (HL). Eye 12.7 times in HL and 2.3 times in snout, closer to rictus than tip of snout. Fleshy interorbital width 8.4 times in head. Gill opening nearly horizontal, its center slightly below mid-body, its length about equal to diameter of eye.

Anterior nostril tubular, minute, not reaching snout tip. Posterior nostril well ahead of eye, a vertical line drawn from it falls nearly 0.5 eye diameter in front of eye; opening small, nearly

circular, forming a small tube in larger individuals.

Jaws subequal, the mouth closing completely. Teeth in jaws (Fig. 3) uniserial, nearly subequal, stout, pointed, and finely serrated. Two depressible long canines along mid-line of intermaxillary, the posterior the largest tooth in the mouth. Three pairs of depressible canines behind mandibular symphysis.

Number of vertebrae 128, 52 before anal fin. The first dorsal pterygiophore arises above the third vertebra.

Head pores (Fig. 2) present but not obvious. A single pore anterior and proximal to, and a second pore below the base of the anterior nostril. Six pores along the mandible, the second through fifth the largest. Four equally spaced pores along the upper jaw, the first beneath the nostril base, the last beneath the center of the eye. A single pore between each anterior and posterior nostril.

Color in isopropyl alcohol brown overlain with a darker speckling throughout, although slightly lighter along the belly. Anus and gill openings within black areas. A prominent black spot behind each eye, with a black slash beginning at the ventral margin of the orbit and ending about an eye's diameter behind the rictus. A black spot



Figure 2. *Gymnothorax breedeni*, paratype, ANSP 134222, 496 mm.

smaller than the eye present beneath the rictus of some specimens. Margin of caudal cream, yellowish in life.

ETYMOLOGY. Named in honor of Vic E. Breeden, president of the Charline H. Breeden Foundation which made this collection and study of Comoran fishes possible.

REMARKS. The closest relative of *Gymnothorax breedeni* appears to be *G. flavimarginatus* (Rüppell, 1828), a wide-ranging species which was either observed or collected at each of the localities where we have taken the new species. *G. breedeni* differs from *G. flavimarginatus* in its coloration (viz., the black markings associated with the eye and jaw and the restriction of the light fin edging to the tail) and in its reduced or lack of vomerine dentition.

The new species is similar in appearance to *G. monostigma* (Regan, 1909) in having a black blotch behind the eye. *G. monostigma* is readily separable in having the lower jaw pores and posterior nostril lying within white spots and in lacking a black area around the gill opening.

The posterior nostril of the new species becomes more tubular with age (see Fig. 2). This condition occurs among several species of various moray genera and is considered by us not significant as a generic character.

A color photograph which nicely illustrates the facial coloration of living *G. breedeni* appeared in Randall and Helfman (1972). Besides the typical material herein described, another specimen of this distinctive species was observed but not collected by Randall at Villingili Island, Maldives, at about 10 m depth.

***Uropterygius kamar* McCosker & Randall, new species**

(Figures 3b & 4, Table 1.)

MATERIAL EXAMINED. *Holotype*: CAS 35251, 249 mm. Archipel des Comores, Isle Grande Comore, Itsandra, 0.5 km north of Hotel Itsandra. Captured in 25 m over coral sand slope, 50 m offshore, using Pronoxfish ichthyocide, on 19 February 1975 by J. E. McCosker, S. McCosker, M.D. Lagios, L. Gunther, and D. C. Powell. *Paratypes*: CAS 35252, 20(73-224 mm), and RUSI 4557, 5(112-215 mm), collected with the holotype. Collected by J. E. Randall using ichthyocides or a hand spear, generally associated with a coral rubble bottom between depths of 3 to 55 m: BPBM 12051, 345 mm, Tahiti, Popote Bay; BPBM 9442, 2(211-228 mm), Palau Is., Augelpela Reef; USNM 215281 (formerly BPBM 15665), 219 mm, Solomon Is., Florida Id.; BPBM 16471, 4(150-325 mm), Pitcairn Id., Oeno Id.; BPBM 16606, 297 mm, Pitcairn Id., Oeno Id.; BPBM 17005, 136 mm, Pitcairn Id.; BPBM 17047, 327 mm, Pitcairn Id. Collected by J. E. Böhlke et al.: ANSP 124794, 3(145-198), Amirantes Is., St. Joseph Id., 15-27 m. ANSP 134217, 11(124-365), Amirantes Is., D'Arros Id., 20-30 m.

DIAGNOSIS. A small species of *Uropterygius* with vertical fins restricted to the tail tip, anus before mid-body, two prominent cephalic lateral

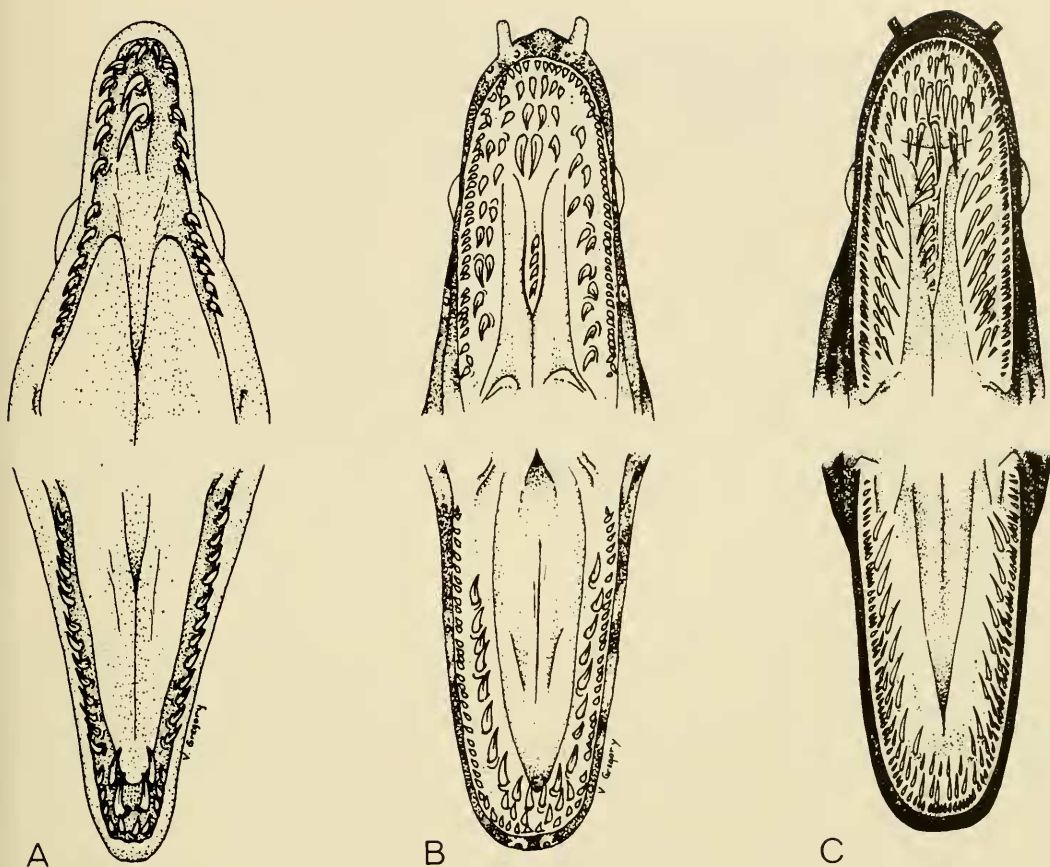


Figure 3. Dentition of: (A) holotype of *Gymnothorax breedeni*, CAS 35250, 530 mm; (B) holotype of *Uropterygius kamar*, CAS 35251, 249 mm; and (C) paratype of *Uropterygius goslinei*, ANSP 117434, 527 mm.

lines pores, posterior nostril not closely associated with a supraorbital pore, triserial maxillary dentition, white elongate anterior nostrils, and a prominent white band in front of the eye.

DESCRIPTION OF HOLOTYPE. (Counts and proportions of the holotype and nine paratypes are given in Table 1.) Body subrectangular in cross section, laterally compressed throughout, its greatest depth 26 times in total length (TL). Body width 1.4 times in depth. Tail longer than body, distance from snout to anus 2.45 times in TL. Head 9.8 times and trunk 3.3 times in TL. Dorsal fin restricted to tail, arising about one-half head length (HL) from tail tip. Snout 6.2 times and

upper jaw 2.7 times in HL. Eye 13 times in HL and 2.2 times in snout, equidistant between snout and rictus. Flethy interorbital width 9.1 times in HL. Gill opening small, ovate and horizontal, lying about mid-body, its length less than eye diameter.

Anterior nostrils elongate, tubular, nearly equal in length to eye, extending noticeably beyond snout. Posterior nostril within the interorbital space, above and slightly in advance of middle of eye, lying within a short tube, the proximal edge flush with the head.

Jaws subequal, the mouth closing completely. Teeth in jaws (Fig. 3b) pointed, recurved. Upper jaw teeth triserial, the outer row teeth small,

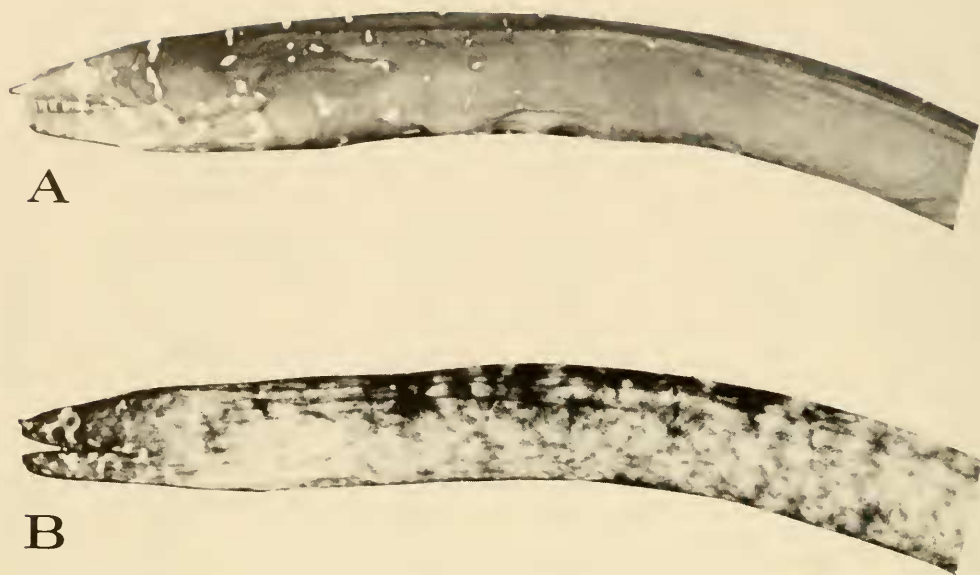


Figure 4. Head and anterior trunk region of paratypes of *Uropterygius kamar*. A. Uniform coloration, BPBM 9442, 228 mm. B. Mottled coloration, BPBM 12051, 345 mm.

numerous and close-set, the middle row teeth somewhat irregular and intermediate in size, the inner row teeth the largest, comprised of widely-spaced depressible fangs. Lower jaw teeth biserial, except triserial anteriorly, the outer row teeth small, numerous and close-set, the inner row teeth widely-spaced, depressible fangs, largest anteriorly. A series of depressible fangs in the intermaxillary region, separated from the uniserial vomerine teeth by a gap.

Number of vertebrae 137, 49 before anal opening. Median fins restricted to the end of the tail, appearing above the 115th vertebra on a radiograph.

Head pores distinct, usually associated with white markings along snout and lips. Anterior nostril bases bordered laterally and ventrally by pores. Six pore pairs along upper and lower jaws, alternating in position. Two supraorbital canal pores. Two cephalic lateral line pores, followed by a minute series of lateral line pores passing along the mid-body to the tail tip.

Color in isopropyl alcohol tan to chocolate brown, distinctively marked by a variable series of white bands along the chin, throat, snout and

nape. A prominent band passes obliquely from the anterior edge of the eye through the posterior nostril and meets its partner along the interorbital space. Anterior nostrils white and connected between their bases by a white stripe. Inside of mouth white. The trunk of small specimens often has a faint series of lighter, broken bands.

ETYMOLOGY. Named in honor of the Archipel des Comores, the location of capture of many of the type specimens. The newly independent Comoran Republic has derived its name from *kamar*, an Arab word for the moon, in reference to the moon-like quality of the volcanic surface of those lovely islands.

REMARKS. This new species is most similar to *Uropterygius xanthopterus* Bleeker (1859), from which it is easily separable on the basis of its distinctive coloration. *U. kamar* also differs from specimens we have identified as *U. xanthopterus* (CAS 35254 from Kapingamarangi and SIO 73-205 from Australia) in having more vertebrae and a more anterior median fin origin (as viewed from radiographs). The new species is also similar to



Figure 5. Head and mid-trunk region of holotype of *Uropterygius goslinei*, CAS 35253, 483 mm.

U. alboguttatus Smith (1962), described from the western Indian Ocean, which is more closely related to *U. xanthopterus* (and possibly synonymous) and differs markedly in its coloration. *U. kamar* differs from its other congeners particularly in its coloration, multiserial dentition, and the presence of two cephalic lateral line pores.

***Uropterygius goslinei* McCosker & Randall, new species**

(Figures 3c & 5, Table 1.)

MATERIAL EXAMINED. *Holotype*: CAS 35253, 483 mm. Palau Is., Kayangel Atoll. Captured in a lagoon 200 m east of the west side of the atoll, in 0-3 m depth over a sand and coral-line algal bed with coral heads, using Noxfish ichthyocide by R. Gaines and party on 8 October 1956. *Paratypes*: Collected in shallow water over sand and coral bottoms using rotenone ichthyocides. CAS 13972, 212 mm, and BPBM 19927, 149 mm, Kapingamarangi Atoll. CAS 29103, 213 mm, Papua, New Guinea, Egum Atoll. USNM 215282 (formerly GVF-1955, Sta. 25), 151 mm, Palau Is., Koror Id. AMS.I. 17600-001 (formerly CAS 13973), 252 mm, Palau Is., Kayangel Atoll. ANSP 117434, 527 mm, Solomon Is., Bougainville. ANSP 124812, 270 mm, Papua, New Guinea, Madang Harbor.

DIAGNOSIS. A moderate length species of *Uropterygius* with vertical fins restricted to the tail tip, anus before mid-body, two cephalic lateral line pores, posterior nostril not closely associated with a supraorbital pore, short jaws, triserial jaw teeth, and a tan coloration overlain by narrow

black bands and white spots and two distinct black stripes behind the eye.

DESCRIPTION OF HOLOTYPE. (Counts and proportions of the holotype and seven paratypes are given in Table 1.) Body subrectangular in cross section, laterally compressed throughout, its greatest depth 18 times in total length (TL). Body width 2.5 times in depth. Tail longer than body, the distance from snout to mid-anus 2.4 times in TL. Head 8.6 times and trunk 3.3 times in TL. Dorsal fin restricted to tail. Snout 6.2 times and upper jaw 2.6 times in head length (HL). Eye 14 times in HL and 2.2 times in snout, its center slightly in advance of middle of jaw. Fleshy interorbital width 8.7 times in HL. Gill opening small, ovate and horizontal, lying about mid-body, its length less than eye diameter.

Anterior nostril tubular, much smaller than eye, not extending beyond snout. Posterior nostril within the interorbital space, above and in advance of eye, lying within a short tube (Fig. 5).

Jaws subequal, the mouth closing completely. Teeth in jaws (Fig. 3c) pointed, recurved. Upper jaw teeth triserial, the outer row teeth small, numerous and close-set, the middle row teeth intermediate in size, the inner row teeth the largest, comprised of depressible fangs. Lower jaw teeth triserial, the outer row teeth small, num-

erous and close-set, the middle row teeth intermediate and not extending beyond mid-jaw, the inner row teeth the largest, comprised of depressible fangs. Intermaxillary region is crowded by a group of large depressible fangs, separated from the uniserial vomerine teeth by a gap.

Number of vertebrae 127, 48 before anal opening. Median fins restricted to end of tail, above the 114th vertebra on a radiograph.

Head pores indistinct. Anterior nostril bases bordered laterally and ventrally by pores. Five pore pairs along upper and lower jaws. Two supraorbital canal pores. Two cephalic lateral line pores, followed by a minute series of lateral line pores passing along the mid-body to the tail tip.

Color in isopropyl alcohol cinnamon, darker dorsally, overlain with narrow black lines which are broken along the lateral mid-line, with white punctations irregularly located between the lines. Two black lines originate at the posterior dorsal and ventral margins of the eyeball and extend 2-3 eye lengths posteriorly.

ETYMOLOGY. Named in honor of William Alonzo Gosline in recognition of his numerous contributions to the study of apodal fishes.

REMARKS. Following Gosline's (1958) key to the central Pacific species of *Uropterygius*, the new

species would be identified as *U. marmoratus* (Lacépède, 1803). *U. goslinei* differs in having two rather than a single cephalic lateral line pore and in its coloration. The new species is similar to *U. xanthopterus* and *U. kamar* in having two pores, but differs in its coloration and its complex dentition, and in attaining a larger size.

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